Implementation of the EPBD Denmark

Status in 2020

Thomsen, Kirsten Engelund; Wittchen, Kim B.; Sandorff, Søren Mark; Hansen, Allan; Kold, Line; Jørgensen, Kasper Eden; Hoang, To Quyen; Varming, Niels Bruus

Published in:
Concerted Action - Energy Performance of Buildings

Publication date:
2020

Document Version
Publisher's PDF, also known as Version of record

CONCERTED ACTION
ENERGY PERFORMANCE OF BUILDINGS

Implementation of the EPBD Denmark

Status in 2020

AUTHORS
Kirsten Engelund Thomsen, Kim B. Wittchen, *Department of the Build Environment, Aalborg University*;

Søren Mark Sandorff, Allan Hansen, Line Kold, Kasper Eden Jørgensen, To Quyen Hoang, *Danish Energy Agency*;

Niels Bruus Varming, *Danish Transport, Construction and Housing Authority*

NATIONAL WEBSITES
www.ens.dk , www.build.dk, www.tbst.dk, www.bygningsreglementet.dk, www.sparenergi.dk, www.boligejer.dk

1. Introduction

This report presents an overview of the current implementation status of the EPBD and relevant initiatives planned in Denmark. The report addresses the methodology for the energy performance calculations for buildings and related requirements, including the Danish requirements for technical building systems. It also provides an update on implementing the EPC and the inspection requirements for heating and AC systems.

An early introduction of future requirements is a tradition in Danish building policy and regulation; it gives the building industry as well as building owners an opportunity to prepare, develop and experiment with the buildings of tomorrow. The method has been a successful way to push the Danish building industry in an ambitious direction and has ensured new buildings to be highly energy efficient at a cost-efficient level. It is also a tradition that future requirements are evaluated before they become final and binding.

The Danish NZEB definition is now the minimum requirement in Danish building regulations and has been mandatory since 1 July 2016. The building regulations still have a voluntary energy class that corresponds to the former Building Class 2020.

At the end of the report, an overview of the new Danish Climate Act, which is expected to form the background for the Danish policy regarding energy efficiency, is provided.

The Danish Energy Agency, under the Danish Ministry of Climate, Energy and Utilities, is responsible for implementing the EPBD in Denmark. The Danish Transport, Construction and Housing Authority, under the Danish Ministry of Transport and Housing, is responsible for the building regulations in Denmark.

2. Current Status of Implementation of the EPBD

2.I. Energy performance requirements: NEW BUILDINGS

2.I.i. Progress and current status of new buildings (regulation overall performance)

The current energy performance requirement methodologies for new residential and non-residential buildings were implemented through the Danish Building Regulation 2006 as an implementation of Directive 2002/91/EC.

Denmark has focused on reducing energy consumption in new buildings for many years. The energy consumption in new buildings has steadily declined since introducing the first energy requirements in building regulations in 1961. Since 2006, requirements have been set for a building's overall energy consumption in accordance with the EPBD. In 2008, the Danish government entered an energy agreement on reducing the energy needs of buildings by 25% in 2010, 25% in 2015 and another 25% in 2020 – a total reduction of 75% compared to the 2006 requirements, which was supported by a broad majority of political parties in the Danish Parliament. In 2010, the first steps were taken by introducing Building Regulation 2010 (BR2010), in which the energy requirements were tightened by about 25% and a voluntary energy class was revised and renamed 'Low-energy Class 2015 (*Lavenergiklasse 2015*)'. Already in 2011, the new 'Building Class 2020' was introduced – also as a voluntary building class – due to requests from the Danish building industry to have sufficient time for developing new products for the future.

In July 2016, the previously voluntary 'Low-energy Class 2015' became final and binding and was renamed the 'Danish Building Regulation 2015 (BR2015)'. The BR2015 sets minimum energy performance requirements for all types of new buildings. In addition to the minimum requirements, the BR2015 also sets requirements for a voluntary low-energy class, 'Building Class 2020' (equivalent to NZEB level at that time). In 2018, the energy performance requirements were slightly changed, primarily due to upgrades of the primary energy factors and the calculation procedure, and were implemented in the Building Regulation 2018 (BR2018). The voluntary class of 2020 was evaluated to be beyond the cost-optimal level and will remain a voluntary low energy class with a small change in the requirements due to updated primary energy factors.

Figure 1. Danish Building Regulations 2018. The Danish Building Regulation (current and historic) can be found at: http://bygningsreglementet.dk (http://bygningsreglementet.dk).

2.I.ii. Format of national transposition and implementation of existing regulations

The BR2018 sets minimum energy performance requirements for all types of new buildings.

The minimum energy performance requirements set the limit in terms of maximum allowed primary energy demand for a building, including, e.g., thermal bridges, solar gains, shading, infiltration, ventilation, heat recovery, cooling, lighting (for non-residential buildings only), boiler and heat pump efficiency, electricity for operating the building as well as sanctions for overheating. The overheating penalty is calculated as a fictive energy demand, equal to the energy demanded by an imaginary mechanical cooling system, in order to keep the indoor temperature at 26°C. This additional energy demand is included in the calculated overall energy consumption of the building by the monthly based compliance checking tool 'Be18' (https://sbi.dk/beregningsprogrammet (https://sbi.dk/beregningsprogrammet)).

Renewable energy is included in the calculation. However, for all buildings, the maximum electricity production to be factored in from RES, e.g., solar cells and wind turbines, corresponds to a reduction of the need for supplied energy of 25 kWh/m² per year in the energy performance framework (primary energy).

For buildings to comply with the BR2018 and the voluntary low-energy class, it must be proved that they have a good thermal indoor climate during periods with higher-temperatures. The indoor temperature in residential buildings must not exceed 27°C for more than 100 hours per year, and 28°C for more than 25 hours per year. This can be done either through 'Be18' or via a dynamic simulation tool. In non-residential buildings, the building owner decides the temperature limits, and summer comfort must be proved using a dynamic simulation tool. Buildings that comply with the BR2018 requirements must have an airtightness that is better than 1.0 l/s.m² at a pressure difference of 50 Pa (for a 'low energy building' this must be better than 0.7 l/s.m²). Additionally, the airtightness for all buildings must be documented, e.g. through a pressurisation test. If there is no pressurisation test, a minimum airflow rate (1.5 l/s.m² at a pressure difference of 50 Pa) is to be used in the calculations.

The minimum energy performance per m² heated gross floor area for the *BR2018* requirements (NZEB - A2015) is:

30 + 1,000 / A [kWh/m^2.year] for residential buildings, and

41 + 1,000 / A [kWh/m^2.year] for non-residential buildings.

The minimum energy performance for the voluntary Low-energy Class (A2020) is:

27 [kWh/m^2.year] for residential buildings, and

33 [kWh/m^2.year] for non-residential buildings.

2.I.iii. Action plan for progression to NZEB for new buildings

Denmark has revised its definition of NZEB following the analysis of the cost-optimal calculations and the Commission's interpretation of when a building should be an NZEB. Denmark has historically used the date of the building permit to decide which requirement should be fulfilled. The Commission interprets the EPBD in a different way and defines the requirement to be for the finished buildings. In line with this, Denmark needed to revise the Danish definition of NZEB.

All new buildings applying for a building permit after 1 July 2016 therefore comply with the NZEB requirements[1].

2.1.iv. Requirements for building components for new buildings

Individual building elements must be insulated to a level ensuring that the heat losses through them do not exceed the values included in Table 1:

Building element	**U-value** [W/m²K]
External walls and basement walls in contact with the soil.	0.30
Suspended upper floors and partition walls adjoining rooms/spaces that are unheated or heated to a temperature which is 5°C or more below the temperature in the room concerned.	0.40
Ground slabs, basement floors in contact with the soil and suspended upper floors above open air or a ventilated crawl space.	0.20
Suspended floors below floors with underfloor heating adjoining heated rooms/spaces.	0.50
Ceiling and roof structures, including jamb walls, flat roofs and sloping walls directly adjoining the roof.	0.20
External doors without glazing.	1.40
External doors with glazing.	1.50
Doors and hatches to the outside or to rooms/spaces that are unheated as well as glass walls and windows to rooms that are heated to a temperature which is 5°C or more below the temperature in the room concerned.	1.80
Skylight domes.	1.40
Insulated sections in glazed external walls and windows.	0.60
Suspended upper floors and walls against freezer rooms.	0.15
Suspended upper floors and walls against cold stores.	0.25
Sliding and folding doors. Reference size is 2.50 m x 2.18 m in 2 and 3 sections, respectively.	1.50
Light-tunnels or similar	2.0
Building element	Linear losses
Foundations around spaces that are heated to a minimum of 5°C.	0.40
Joint between external wall and windows or external doors and hatches.	0.06
Joint between roof structure and roof lights or skylight domes.	0.20

Table 1: Maximum U-values and linear losses.

Additionally, the energy balance of windows and glazed outer walls must not be less than -17 kWh/m²/year (equal to a B-label window in the voluntary Danish window labelling scheme). The energy balance through roof lights and glazed roofs must not be less than 0.0 kWh/m² per year. The energy balance is calculated for a standard sized window with standardised outdoor conditions.

Additionally, new buildings must be designed and constructed so that the design transmission loss per m² heated gross floor area does not exceed 12.0 + 6.0/E + 300/A (voluntary low-energy class: 11.0 + 6.0/E + 300/A), where E represents the number of floors and A the heated floor area. The number of floors is a decimal number, which is calculated as heated floor area divided by the built-up area (the building's vertical projection on the ground in case of split-levels). Design temperatures are defined in Danish Standard DS 418:2011. Buildings with an average room height above 4.0 metres receive a supplement of 1.0 W/m² per metre. A heated basement, which is not part of the floor area, is only partly included in the calculation.

Non-residential buildings can get an addendum in the energy framework due to special use conditions in the building. The special conditions and standard values are listed below. The extension is calculated as a difference between a standard calculation and a calculation using actual values.

- Common lighting level above 300 lux;
- Ventilation rate above 1.2 l/sec per m² heated floor area;
- in-use hours during the heating season to meet the atmospheric indoor climate;
- Domestic hot water consumption above 100 l per m² heated gross floor area per year;
- Weekly usage hours above 45 hours per week;
- Ceiling height above 4.0 m.

2.I.v. Enforcement systems new buildings

When a new building is planned and before construction works can start, the building owner applies for a building permit. The municipality is responsible for issuing building permits. In the building permit, the geometry of the building needs to be documented, but information about the technical building systems are not requested in the planning phase. After the building is finished, the building owner or advisor will send in documentation for the building's fulfilment of the building regulations.

The municipality does not need to check the correctness of all documentation, but they must check that all required documentation is available. In 10 % of the building projects, the municipality must check all documentation in detail.

If there are any uncertainties around the fulfilment of the building regulations, the municipality can advise the building owner on how to meet the requirements.

2.II. Energy performance requirements: EXISTING BUILDINGS

2.II.i. Progress and current status of existing buildings (regulation overall performance)

As an alternative to the component requirements, two voluntary renovation classes have been introduced:

- A residential building may be classified as 'Renovation Class 2' when the total demand for energy supply for heating, ventilation, cooling and domestic hot water per square meter of heated floor area does not exceed 70.0 kWh/m² per year plus 2,200 kWh per year divided by the heated floor area.
- A residential building may be classified as 'Renovation Class 1' when the total demand for energy supply for heating, ventilation, cooling and domestic hot water per square meter of heated floor area does not exceed 52.5 kWh/m² per year plus 1,650 kWh per year divided by the heated floor area.

Requirements for non-residential buildings are presented below. Verification must be on the basis of 'Energy demands of buildings *(SBi Direction 213 Bygningers energibehov)*'[2] where the energy demand for the whole building must be calculated.

To comply with the renovation classes, the requirement for supplied energy must be improved by at least 30 kWh/m² per year. To obtain 'Renovation Class 1', the requirements for the indoor climate for new buildings must be observed as well.

Renovation classes for both residential and non-residential buildings are defined as:

The energy performance framework for the voluntary '*Renovation Class 2'* (Energy label B) is:

70 + 2,200 / A [kWh/m^2.year] for residential buildings, and

95 + 2,200 / A [kWh/m^2.year] for non-residential buildings

The energy performance framework for the voluntary '*Renovation Class 1'* (Energy label A2010) is:

52.5 + 1,650 / A [kWh/m^2.year] for residential buildings, and

71.3 + 1,650 / A [kWh/m^2.year] for non-residential buildings

2.II.ii. Regulation on individual parts, distinct from whole building performance

The BR2015 tightened the energy performance requirements for individual building components for all building types. This applies to the replacement of components and to major renovations. In case of renovations, measures must be economically and technically feasible, i.e., they must have a simple payback time of less than 75% of their expected lifetime as defined in the Danish Building Regulations. In case of the full replacement of a component (e.g., a new roof, new window, new outer wall), the new component must meet the requirements set in the BR2018, regardless of profitability.

All existing buildings	Changed use and extensions	Single component requirements for new / replaced parts*	Holiday homes	Minimum requirements*
U-value requirements [W/m²K]				
External walls and basement walls towards ground	0.18	0.15	0.25	0.30
Slab on ground, etc.	0.10	0.10	0.15	0.20
Loft and roof constructions	0.12	0.12	0.15	0.20
Windows	-	1.80 (doors)	1.80	-
Roof windows	-	-	1.80	-
Thermal bridges [W/(mK)]				
Foundations	0.12	0.12	0.15	0.40
Joints between windows and walls	0.03	0.03	0.03	0.06
Joint between roof structure and windows in the roof	0.10	0.10	0.10	0.20
Minimum energy gain [kWh/m².year]				
Facade windows	-17	-	-17	-17
Roof windows	0	0	-	0

Note: Minimum requirements are primarily set to eliminate the risk of surface condensation and hence mould growth. Applies for both new and existing buildings being renovated.

Table 2. U-values and thermal bridges requirements for existing buildings – examples.

2.II.iii. Initiatives/plans to improve the existing building stock

The government has developed a comprehensive strategy for the energy upgrading of the existing building stock. The implementation of the initiative started in 2014, including the analysis of the energy requirements for the *BR2015*. The current legislation is now BR2018, which keeps the initial energy requirements and further improves some aspects of the legislation. Additional improvements are also implemented through the 'Energy Efficiency in State Institutions (*Cirkulære om energieffektivisering i statens institutioner*)' legislation and the Danish 'Energy Efficiency in Public Buildings' legislation which both implement a national initiative to reduce energy consumption.

The requirements for conversion may be met through component requirements mentioned in Table 2 or through compliance with the energy performance frameworks for existing buildings corresponding to the calculation for new buildings. The use of the energy framework mentioned in section 2.II.i for existing

buildings is a voluntary option for owners that engage in deep energy renovation projects. This method is intended to increase the number of NZEB, as the owner has the possibility to look at the buildings' energy performance in a more holistic way.

Denmark is via national legislation committed to reduce the energy consumption in buildings owned and used by the government by 14% within the 2006-2020 period. This legislation aims to improve the energy efficiency of public buildings. According to EED article 5, Denmark is also committed to acquire energy savings equivalent to 34.399 MWh in the 2014-2020 period, corresponding to an energy reduction of 10.5%. EED article 5 does not regulate the same as the national legislation; EED article 5 only affects buildings that are owned and used by the government, whereas the national legislation affects all governmental buildings not covered by the EED. Article 5 is implemented via the alternative approach described in the provision.

2.II.iv. Long Term Renovation Strategies, status

Denmark submitted its Long-Term Renovation Strategy (LTRS) on 10 March 2020. The LTRS outlines the energy efficiency initiatives agreed upon in the Danish Energy Agreement of 2018 for the 2021-2024 period. In accordance with the Energy Agreement, Denmark has established a number of policies and measures to promote cost-effective and comprehensive energy renovation efforts, including targeting public buildings and the least energy-efficient segments of the building stock.

The existing measures to support energy renovation of existing buildings are:

- Taxes on energy use for heating of buildings;
- Requirements in the building code;
- EPC for buildings;
- A new support scheme in 2021-2024 for energy renovation of existing buildings;
- Subsidy scheme to replace oil burners with heat pumps in buildings outside the district heating and gas grids;
- Information activities;
- Data and digitalisation;
- The building job scheme ('*Bolig Job ordningen*')[3] - see case below.

Additionally, a number of analyses have been initiated in 2019 in order to promote the renovation of buildings. The findings of these analyses can, if relevant, form the basis for possible additional work related to the promotion of building renovations in the coming years.

The indicative milestones of the long-term strategy for renovating the national building stock and the roadmap with domestically established indicators will be outlined in the Danish Climate Action Plan, which is to be presented according to the Danish Climate Act (see Section 4), likely in the first quarter of 2021.

Case – The Building Job Scheme

The Building Job Scheme makes it possible to get a tax deduction on salary expenses for energy efficient building improvements (also cleaning help and others) – both for private homeowners and tenants. The improvements that are deductible change over time. In 2020, it is possible to get a deduction for, e.g., the following services:

- Installation, repair or replacement of solar panels;
- Installation, repair or replacement of solar cells;
- Installation, repair or replacement of household wind turbines;
- Heat pumps, including air-to-air heat pumps with and without cooling function;
- Geothermal heating: The entire geothermal heating system;
- Installation or improvement of ventilation;
- Radon extraction;
- Installation of security-systems;
- Services related to broadband connection/installation.

The Scheme allows for a deduction of DKK 6,200 per person for cleaning services etc. and a deduction for building improvements of DKK 12,500 per person over the age of 18 in the household. The Scheme has been a huge success, and approximately 75% of all the approved deductions concerned energy efficient building renovations.

2.II.v. Financial instruments and incentives for existing buildings

Financing for energy efficiency measures in buildings in Denmark is primarily a matter for the commercial sector. Building owners have easy access to capital for improving their buildings through the well-functioning Danish mortgage system. The system gives owners of new as well as existing buildings the opportunity to borrow money at attractive rates and conditions; in 2020 the interest rate has been below 1%, and for some types of loans the interest rate has been negative.

On an annual basis, between 10 and 13 billion € – equivalent to 2.1-2.7% of the value of the building stock – is invested in various forms of renovations and other investments in buildings. There is a wide range of national schemes which aim to boost investments in energy efficiency in buildings.

Among these initiatives are:

1. **A tax-deduction scheme**[4] for deducting salary expenses for works in relation to green initiatives in private buildings. It is possible to get a tax deduction of up to DKK 12,200 per person per year (in 2019) for working wages, incl. VAT related to renovation services performed in the home. The deduction is possible when replacing windows, improving heating systems, replacing heat control systems, etc. So far, the scheme has no expiry date.
2. **The 'BetterHouses (*Bedre Bolig*)'**[5] initiative, a one-stop shop for assisting homeowners as regards cost-optimal energy savings. As of 2017, the scheme has been extended to include apartment blocks and large buildings.

3. **The 'Building scheme (*Bygningspuljen*)'**[6] initiative is a scheme with DKK 200 million allocated to energy savings in buildings in the 2021-2024 fiscal years. As the savings potential is greatest in housing, efforts are focused solely on this segment. The grant is given to building owners who can document the greatest energy saving potential (maximum saving in kWh/m^2).

4. **The 'Competitive subsidy scheme related to private enterprises (*Erhvervspuljen*)'**[7] initiative is a pool of DKK 300 million per year in the 2021-2024 period, for savings in process energy in the industrial and service sectors, including commercial buildings.

5. Finally, a new subsidy-scheme for replacement of oil heating boilers will be open from 2021. The scheme covers the 2021-2024 fiscal years with DKK 20 million per year to support the replacement of oil heating equipment with heat pumps.

Figure 2. The 'Bedre Bolig' ('BetterHouses') campaign - [www.BedreBolig.dk](https://sparenergi.dk/forbruger/vaerktoejer/bedrebolig) (https://sparenergi.dk/forbruger/vaerktoejer/bedrebolig).

2.II.vi. Information campaigns / complementary policies

Improving building energy efficiency and modifying behaviour regarding building usage is a priority of the Danish consumer information campaign. The Danish Energy Agreement of June 2018 includes measures to improve consumer information and awareness, targeted at end users. Furthermore, the agreement includes measures for improving data and digitalisation usage, to promote energy efficiency.

Previous and current activities aim at producing information material in cooperation with relevant actors dealing with energy saving. The importance of the local perspective and private ownership is a significant part of the activities. This involves preparing material on energy efficient solutions, information on building regulations, and better access to information and knowledge about energy renovation.

Figure 3. Sample of popular guides targeting private households.

The Danish Energy Agency's website www.SparEnergi.dk (http://www.sparenergi.dk/) is the backbone of communication with end users concerning energy efficient solutions, both in private households and in public and private enterprises. The website contains a variety of tools, information and knowledge that supports energy saving. The Danish Energy Agency also offers free-of-charge telephone support and email advice, as well as information activities about available energy-consulting services for private households.

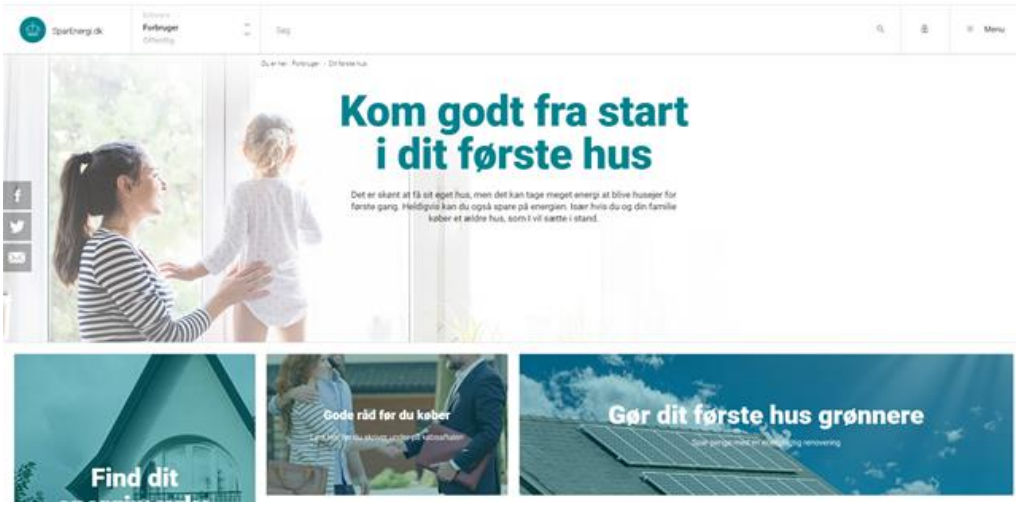

Figure 4. Campaign on SparEnergi.dk (http://SparEnergi.dk).

Furthermore, a number of initiatives have been launched to promote the EPC and to reduce energy consumption in buildings, e.g., 'BetterHouses' and several information campaigns. 'BetterHouses' is a Danish national consultancy scheme, which is voluntary and market driven. It extends the EPC scheme and aims to promote the refurbishment of private residential buildings by removing barriers and making it easier and more manageable to refurbish and reduce the buildings' energy consumption through counselling during the building process.

2.III. Energy performance certificate requirements

2.III.i. Progress and current status on EPCs at sale or rental of buildings

The Danish Energy Agency is responsible for implementing the EPC system. All EPCs are registered in a central database and displayed on the public website www.sparenergi.dk (http://www.sparenergi.dk/). In Denmark, a total of around 60,000 new EPCs are registered annually (Table 4).

Year	2010	2011	2012	2013	2014	2015	2016	2017*	2018	2019
Single-family	50,774	41,904	41,359	43,493	44,524	48,903	52,205	54,366	52,298	52,750
Multi-family	8,891	5,466	5,312	4,758	4,383	5,179	5,202	5,689	3,312	3,367
Non-residential	6,567	3,256	3,099	4,347	3,557	3,212	4,672	5,223	2,988	2,673
Holiday houses	4,418	389	726	824	871	886	922	667	-	-
Total	70,650	51,015	50,496	53,422	53,335	58,180	63,001	65,945	58,598	58,790

* As of September 2017, energy labeling of holiday houses was no longer required.

Table 3. Number of yearly issued EPCs from 2010 to 2019.

It is estimated that the compliance level is high due to few complaints received from tenants and buyers.

A survey from 2016 reveals a high awareness of the EPC in Denmark. Nine out of 10 respondents recognise that they have received an EPC when purchasing their property. In addition to that, 92% have read parts of the report, and more than half have read the entire report.

The survey also showed that the recommendations in the EPC report are particularly relevant to owners with properties marked as either D, E, F or G. Among these, 39% have acted on the proposals in the EPC report to make energy-efficient renovations.

Figure 5. Labels used in the Danish building energy performance certification scheme.

2.III.ii. Quality Assessment of EPCs

In 2019, the quality assessment of EPCs in Denmark transitioned from a random selection methodology to a risk-based methodology. The risk-based methodology utilises the data collected by the assessors and stored in the database, by detecting the possible faulty EPCs based on the input parameters. In addition, the Danish Energy Agency conducts quality controls based on complaints received from owners. Annually, the Danish Energy Agency reviews approximately 200 EPCs.

In Denmark, the assessors can receive different levels of penalties when violating the rules regarding EPC issuing:

1. In case of error, companies must correct the certificate.
2. In case of serious errors, the company will get a warning notice and the certifying accreditation agency is informed.
3. In cases where errors are serious and/or repeated, a public notice will be made available online as an additional sanction. The certifying accreditation agency is informed and is able to suspend the certification of the company if they find it appropriate. Companies must carry out their own quality control according to DS/EN ISO 9001.

Besides this risk-based methodology, validation of input parameters in the software for EPC issuing has been developed and is being continuously implemented from 2019 on. This initiative will prevent the entering of incorrect and unlikely values when preparing the EPC. Based on the results from the risk-based quality assessment, further validations to the input parameters will be implemented.

The Danish Energy Agency has systematically worked on increasing the overall quality of the EPCs, with the aim of making more effective use of energy labels. A series of meetings with stakeholders who have special knowledge of the scheme have been conducted. Based on these expert inputs and analyses made by the Danish Energy Agency, a number of concrete measures will be implemented to ensure energy labelling which promotes an energy-efficient building stock in Denmark.

This means that the energy labelling scheme will try to take into account the different needs of building types by dividing them into three categories, which are: smaller existing buildings, larger existing buildings and new buildings.

Initiatives aimed at improving the quality and promoting the use of energy labels are initiated for each category, e.g.:

- Conduct behavioural experiments with user-driven design and interactive dissemination of the energy labelling report;
- Make building data from energy labelling more accessible to owners of large buildings in relation to operation, maintenance and energy optimisation;
- Clarify the role of energy labelling companies to ensure that energy labelling is an independent control of the building's energy performance.

2.III.iii. Progress and current status of EPCs on public and large buildings visited by the public

An EPC for a public building or a large building often visited by the public has the same format, content and validity as an EPC for any other building type. In addition, it is required that the EPC is placed somewhere visible to the public. Key information about the certificate is available on www.boligejer.dk (http://www.boligejer.dk/), where it is possible to find the calculated consumption as well as the name of the energy expert and the certified company who issued the certificate.

In 2019, the Danish Energy Agency carried out an analysis to identify the extent to which data from the energy labelling scheme is included in existing commercial digital products, addressed to building owners with the aim of supporting maintenance and energy efficiency. The analysis concluded that a number of actors work systematically to use energy labelling data and that such data is of great value to building owners.

2.III.iv. Implementation of mandatory advertising requirement - status

In July 2012, a new act implemented mandatory advertising requirements and provided sanctions in case of non-compliance.

When a building is being sold or rented out, the commercial media advertisement must display the EPC label. If the advertising requirement is not adhered to, the seller can be fined DKK 2,000 (268 €); the real estate agent can also be fined. Imposing fines in relation to missing energy labels has only seen limited use. Injunctions have instead been employed and complied with.

The Danish Energy Agency finds the level of statutory compliance high especially in relation to buildings advertised for sale. This may be explained by the fact that most real estate sales in Denmark are handled by professional agents.

In 2019, the Danish Energy Agency started to develop three-year strategic plans to ensure compliance of the mandatory advertising requirements. At the same time, reactive inquiries about advertisements lacking energy labels are being handled on an ongoing basis, with very few annual inquiries.

2.IV. Smart buildings and building systems

Denmark has implemented the EPBD requirement for building automation and control systems. Denmark does not have an official definition of smart buildings but has issued requirements or indirect requirements to optimise the technical building system using smart technologies, e.g. heating systems should be equipped with room temperature regulation and outdoor temperature regulation.

In addition to this, there has been a focus on how the technical building systems work in practice and Denmark has, over the last few years, strengthened the requirements for technical building system testing. These requirements will also cover the new technical building system according to the EPBD, renewable energy systems and building automation.

2.IV.i. Status and plans on smart buildings

Work is constantly evolving on updating and developing requirements for technical building systems and the calculation methodology to support the requirements for smart buildings.

2.IV.ii. Regulation of system performance

It is a general requirement in the Danish Building Regulations that services have to be built in a manner that prevents unnecessary energy consumption. This means, e.g., heating systems must be designed and built for energy-efficient operation, including the components, which must be compatible with one another and suited to the intended use of the building and building systems.

The Danish Building Regulations include requirements for a wide range of technical building systems.

There are specific energy-related requirements for boilers based on coal, biomass and similar fuels. Boilers operating on coal, biofuels and biomass should, as a minimum, meet the energy requirements of boiler class 5 in the standard EN 303-5.

The Ecodesign Regulations include requirements for ventilation units, combined heat & power appliances, oil/gas boilers, heat pumps and circulation pumps for installations. These requirements replace the former requirements for individual components in the 'Danish Building Regulation 2015' and are included in the 'Danish Building Regulations 2018'. In the long term, these references will be phased out, as it will be the duty of the owner to stay up to date on existing and new requirements in EU regulations.

Heating and cooling systems must be sized, designed, controlled and operated as specified in the Danish Standard DS 469 'Heating and cooling systems in buildings (*Varme - og køleanlæg i bygninger*)', which has different functional requirements for the commissioning of heating and cooling systems as well as additional requirements for use, operation and maintenance. Ventilation systems must be designed, installed, fully commissioned and handed over as stated in DS 447 'Ventilation for buildings – mechanical, natural and hybrid ventilation systems (*Ventilation i bygninger - Mekaniske, naturlige og hybride ventilationssystemer*)'.

All technical building systems must be insulated as required by DS 452 'Thermal insulation of technical installations (*Termisk isolering af tekniske installationer*)'.

2.IV.iii. Building Automation and Controls (BACs)

Denmark has implemented all relevant EPBD requirements, including the threshold of 290 kW. However, since the energy performance of buildings and the calculation methodology normally makes BACs one of the easiest ways to fulfil the requirements, Denmark expects that most buildings under the threshold of 290 kW also choose to have BACs.

2.IV.iv. Status and encouragement of intelligent metering

Technical building systems with significant energy consumption must have individual meters installed if energy consumption exceeds a certain level.

System	Minimum annual energy use triggering metering
Heat pumps / cooling plants	3,000 kWh electricity
Server rooms	Always
Ventilation units	3,000 kWh electricity for air transport
Heating coils	3,000 kWh electricity or 10,000 kWh heat
Domestic hot water	10,000 kWh heat for heating and circulation of domestic hot water

Table 4. Minimum annual energy use that triggers metering for individual parts of technical building systems.

2.IV.v. Progress and current status on heating systems (Inspection / Equivalence)

Until 2011, Denmark was implementing Article 14 of the EPBD through mandatory regular inspections of heating systems. However, it was then estimated that the use of regular inspections was not cost-effective within the Danish legislative framework. Therefore, since 2012, the Danish implementation of Article 14 is done through a number of activities such as advisory service, tax benefits and requirements to use RES for building heating, each of which contributes to increasing efficiency or phasing out oil and natural gas boilers. The Danish implementation of Article 14 should be seen as part of a long-term political goal to phase out fossil fuels. Thus, the initiatives for oil-fired boilers are mainly focused on replacement of these boilers with other heating sources, e.g., heat pumps, district heating, or solar energy.

To ensure the maintenance of heating systems which are not phased out, a number of measures contribute either to the efficiency or the phasing out of oil-fired and natural gas boilers. These measures include campaigns to increase building owners´ awareness of the potential value of service checks, as well as the promotion of qualified service providers.

As alternatives to inspections (paragraph 3, article 14), the following initiatives have been implemented to help ensure a higher energy efficiency of heating systems in Denmark:

- Tax deduction for labour costs related to building renovations ('*Bolig-job-ordning'*). The tax deduction has allowed building owners to include the cost of labour for renovations in their tax return forms,

thereby giving them incentives to undertake renovation works such as the replacement of heating systems.

- Advisory services for craftsmen and building owners ('*Videncenter for Energibesparelser i Bygninger*'). This service targets craftsmen and provides information and guidelines about how, e.g., to improve heating systems.

- SparEnergi.dk (http://SparEnergi.dk) is an informative website concerning how to save energy, targeting both users, companies and the public. There is, among other things, thorough information on the advantages and disadvantages of the various heating systems as well as important factors to insure energy efficiency for the various heating systems.

- Obligations for energy service companies to implement energy savings for their customers.

- Reduced energy taxes for heat pump owners compared with owners of other kinds of heating systems. The tax reduction makes electricity-based heating such as heat pumps more cost-efficient compared to oil or other fossil fuels.

- Requirements for the use of RES in certain types of buildings and efficiency requirements for boilers. In new buildings, heating with oil or gas is no longer allowed, which means that district heating, heat pumps and other heating systems with high efficiency are promoted. In existing buildings, old heating systems must be replaced with district heating, natural gas boilers or RES if the building is placed within a district heating or natural gas grid.

2.IV.vi. Progress and current status on AC systems (Inspection / Equivalence)

Until January 2016, Denmark was implementing Article 15 of the EPBD through regular inspections of all AC and ventilation systems with an effective rated output of more than 5 kW. The AC and ventilation systems must undergo an inspection every five (5) years.

As alternatives to inspections (paragraph 3, article 15), the following initiatives have been implemented to help ensure a higher energy efficiency of AC and ventilation systems in Denmark:

- **SparEnergi.dk** is an informative website concerning how to save energy, targeting both users, companies and the public. There is, among other things, thorough information on demand management, measurement of electricity consumption for cooling, use of passive cooling, troubleshooting and a procurement guide that aims to reduce the heat subsidy from electricity consuming installations.

- **Subsidy for electricity intensive companies.** ('*Tilskud til elintensive virksomheder*') ensures that companies can receive subsidies for their Public Service Obligation's payment when implementing energy savings. The scheme closes at the end of 2020.

- **The Competitive subsidy scheme related to private enterprises** is a result of the energy agreement from June 2018 and distributes DKK 300 million per year from 2021 to 2024. The subsidy can be granted to projects in which more than 50% of the savings can be found in process energy.

- **Requirements in the Building Regulations for new space cooling systems** includes requirements for controlling of the flow temperature and time control of the cooling. It is assumed that the two requirements result in an energy saving of 5% compared to a situation where the requirements had not been met.

- **The Energy Efficiency in State Institutions legislation** ('*Cirkulæret om energieffektivisering i statens institutioner*') was issued as part of the energy agreement of February 2008 but was revised in January 2020 to ensure the implementation of the EU's Energy Efficiency Directive. It is up to each individual ministry to ensure that the goal of reducing energy consumption is achieved.

The Work Environment of Denmark requires a mandatory inspection of a 70 kW cooling system. The Danish Technological Institute has assessed that this inspection in itself does not result in significant energy savings. However, 90% of companies choose to carry out a voluntary inspection focusing on maintenance, where the plant is inspected for faults and the components are cleaned up in connection with the compulsory inspection.

2.IV.vii. Enforcement and impact assessment of inspections

It is the responsibility of the owner of an AC installation to get the required inspections to confirm whether conditions are met. If the mandatory energy measurement or inspections are not carried out, the owner of the AC may face fines.

In 2013 (latest figures), 131 inspections of AC and ventilation systems were carried out and reported. Of those, 27 inspection reports were controlled by the Danish Accreditation and Metrology Fund.

3. A success story in EPBD implementation

Common database with information on the existing building stock

In Denmark, an energy certification scheme has been mandatory since 1997. Information on the physical state of the existing building stock is collected by energy experts while carrying out an energy audit for issuing an EPC. All data from the certification scheme is gathered in a common database, so a wide range of information with respect to the building stock is available. This knowledge is used in many ways, e.g., in numerous analyses of energy-saving potential. The first comprehensive analysis was made in 2004 and the most recent one was published in November 2017. Some results show that it is possible to obtain a 28% reduction of the heat demand until 2050 if buildings that are being renovated due to end of service life would simultaneously undergo an energy upgrade. In the analysis, it is assumed that the buildings are thermally upgraded in accordance with the requirements stated in the 'Danish Building Regulations 2010'.

The available data offers a snapshot of the energy standard in the Danish building stock and has been made accessible for research. The analyses have been used for different purposes in the government's strategies for energy upgrading of the existing building stock. The most recent analysis of the Danish building stock and its energy-saving potential is available in the report 'Potential heat savings during ongoing renovations of buildings until 2050', SBI 2016:04[8], and has been used as part of the foundation for the Danish strategy for energy performance upgrading of the existing building stock, 'The road to energy efficient buildings in the future (*Vejen til energieffektive bygninger i fremtidens Danmark*)'[9].

Furthermore, a new analysis has been documented in 'Heat savings in existing buildings – potential and economy (*Varmebesparelse I eksisterende bygninger – Potentiale og økonomi*)'[10,] SBi 2017:16, based on the available data[7]. The purpose was to analyse the extent to which it is necessary to include RES in the energy performance calculation, in order to compensate for the fact that some buildings may have higher energy needs than the average building due to architectural requirements or limitations from local plans. How and to what extent RES are used as a buffer in such cases is being investigated.

These examples show that data of the existing building stock and energy conditions can be used for many useful analyses and is essential to form future national energy strategies.

4. Conclusions, future plans

Transposition of the EPBD

The transposition of Directive (EU) 844/2018 was completed on 10 March 2020. The requirements for e-mobility have been transposed by '*Bekendtgørelse om forberedelse til og etablering af ladestandere i forbindelse med bygninger (ladestanderbekendtgørelsen)*'[11]. The requirements for BACS and adjustments to the requirements for testing of the technical building systems have been transposed in the building regulations.

The Long-Term Renovation Strategy (LTRS) was also made public on 10 March 2020. The LTRS advocates additional measures for cost-effective energy renovation efforts such as targeting public buildings and buildings with the worst energy efficiency performance, to decrease the amount of energy used in buildings. In 2019, further analyses have been initiated and the conclusions from these analyses will contribute to constructing a foundation for further improvements in the coming years.

The Danish Energy Agency and the Danish Transport, Construction and Housing Agency has made large efforts to raise public awareness concerning energy use. Information campaigns, web-based interactive tools regarding energy saving measures, etc. have been widely distributed, and public awareness has risen considerably. Denmark has succeeded in making the EPC visible, rendering it a clear sales parameter in the market. In addition, the demand for data from the energy-labelling database is increasing. Denmark is currently implementing a number of concrete measures based on stakeholder involvement to ensure that EPCs are uniform and of high quality.

The Climate Act

In December 2019, eight out of the ten political parties in the Danish Parliament agreed on a legally binding national Climate Act, with a legally binding target to reduce greenhouse gas emissions by 70% by 2030 (compared to the 1990 level). The emissions are calculated in accordance with the UN accounting rules.

The Climate Act includes a number of deliverables to achieve a wide impact on Denmark's climate policy: every year, the Danish Government must present Climate Action Plans with concrete political initiatives to decarbonise every sector from transport to energy efficiency, housing and energy. The Climate Act also contains a mechanism for setting milestone targets. Every five (5) years, the government must set a legally binding target with a ten-year (10-year) perspective. The milestone targets will be implemented into Danish law.

The Danish Council on Climate Change will present their professional assessment of whether the initiatives in the Climate Action Plan are sufficient to reduce emissions. The Danish Council on Climate Change also provides recommendations on climate initiatives. The council's budget will be more than doubled, compared to before the Climate Act, and more experts will be added to the council. Furthermore, the council's political independence has been strengthened, as it can now elect its own chairperson and members.

The Climate Act also commits the Government to separately report on Denmark's impact on international emissions. Reductions from electricity produced from RES and the effects of Denmark's bilateral energy

cooperation with fifteen (15) countries can be taken into account. Furthermore, the Climate Act will shed light on the impacts of consumption on the climate. Finally, the Climate Act commits the Government to form a yearly global climate strategy to ensure that Denmark keeps on its ambitious work at the global scene.

Endnotes

1. The Danish national plan for NZEB can be found at *http://eur-lex.europa.eu/legal-content/DA/TXT/HTML/?uri=CELEX:52013DC0483R(01)&from=EN* (http://eur-lex.europa.eu/legal-content/DA/TXT/HTML/?uri=CELEX:52013DC0483R(01)&from=EN).
2. https://sbi.dk/beregningsprogrammet/Pages/Start.aspx (https://sbi.dk/beregningsprogrammet/Pages/Start.aspx)
3. https://skat.dk/skat.aspx?oid=2234759 (https://skat.dk/skat.aspx?oid=2234759)
4. https://skat.dk/skat.aspx?oid=2234759 (https://skat.dk/skat.aspx?oid=2234759)
5. https://sparenergi.dk/forbruger/vaerktoejer/bedrebolig (https://sparenergi.dk/forbruger/vaerktoejer/bedrebolig)
6. https://ens.dk/service/tilskuds-stoetteordninger/bygningspuljen (https://ens.dk/service/tilskuds-stoetteordninger/bygningspuljen)
7. https://ens.dk/ansvarsomraader/energibesparelser/virksomheder/erhvervstilskud-til-energieffektiviseringer (https://ens.dk/ansvarsomraader/energibesparelser/virksomheder/erhvervstilskud-til-energieffektiviseringer)
8. https://ec.europa.eu/energy/sites/ener/files/documents/2014_article4_da_denmark.pdf (https://ec.europa.eu/energy/sites/ener/files/documents/2014_article4_da_denmark.pdf) https://sbi.dk/Pages/Varmebesparelse-i-eksisterende-bygninger.aspx#s=2017:16 (https://sbi.dk/Pages/Varmebesparelse-i-eksisterende-bygninger.aspx#s=2017:16)
9. http://sbi.dk/miljo-og-energi/energibesparelser/potential-heat-savings-during-ongoing-renovations-of-buildings-until-2050 (http://sbi.dk/miljo-og-energi/energibesparelser/potential-heat-savings-during-ongoing-renovations-of-buildings-until-2050)
10. http://sbi.dk/miljo-og-energi/vedvarende_energi/vedvarende-energi-i-energirammen/vedvarende-energi-i-energirammen (http://sbi.dk/miljo-og-energi/vedvarende_energi/vedvarende-energi-i-energirammen/vedvarende-energi-i-energirammen)
11. https://www.retsinformation.dk/eli/lta/2020/181 (https://www.retsinformation.dk/eli/lta/2020/181)

Annexes - Key Implementation Decisions

Key Implementation Decisions - General Background

no	Key Implementation Decisions – General Background	Description / value / response	Comments
01.01	Definition of public buildings (according to article 9 b)	'Public building' means a roofed construction with walls, owned or used by the state, and for which energy is used to condition the indoor climate.	
01.02	Definition of public buildings used by the public (according to article 13)	A roofed construction with walls, owned or used by the state and accessible for the public, and for which energy is used to condition the indoor climate.	
01.03	Number of residential buildings	1,482,029	Statistical year 2019 (www.dst.dk (http://www.dst.dk))
01.04	Number of non-residential buildings	771,289	Statistical year 2019 (www.dst.dk (http://www.dst.dk))
01.05	If possible, share of public buildings included in the number given in 01.04	84,582	Statistical year 2019 (www.dst.dk (http://www.dst.dk))
01.06	If possible, share of commercial buildings included in the number given in 01.04	686,707	Statistical year 2019 (www.dst.dk (http://www.dst.dk))
01.07	Number of buildings constructed per year (estimate)	28,245	Statistical year 2019 (www.dst.dk (http://www.dst.dk))
01.08	If possible, share of residential buildings constructed per year (estimate, included in the number given in 01.07)	-	
01.09	If possible, share of non-residential buildings constructed per year (estimate, included in the number given in 01.07)	-	
01.10	Useful floor area of buildings constructed per year in million square meters (estimate)	6,69 Mm^2	Statistical year 2019 (www.dst.dk (http://www.dst.dk))

Key Implementation Decision – New Buildings

no	Key Implementation Decision – New Buildings	Description / value / response	Comments
02.01	Are building codes set as overall value, primary energy, environment (CO_2), reference building or other	Primary energy	Primary energy factors: • Electricity: 1.90 • District heating: 0.85 • Other: 1.0
02.02	Requirements for energy performance of residential buildings in current building code	30+1,000/A kWh/m^2 per year	Primary energy, where A is the heated gross floor area.
02.03	Requirements for energy performance of non-residential commercial buildings in current building code	41+1,000/A kWh/m^2 per year	Primary energy, where A is the heated gross floor area.
02.04	Requirements for energy performance of non-residential public buildings in current building code	41+1,000/A kWh/m^2 per year	Primary energy, where A is the heated gross floor area. Given the fact that the building is non-residential.
02.05	Is the performance level of nearly zero energy (NZEB) for new buildings defined in national legislation?	Yes, in Building Regulation as of 1 July 2016.	
02.06	Nearly zero energy (NZEB) level for residential buildings (level for building code)	30+1,000/A kWh/m^2 per year	Primary energy, where A is the heated gross floor area.
02.07	Year / date for nearly zero energy (NZEB) as level for residential buildings (as indicated in 02.04)	1 July 2016	
02.08	Nearly zero energy (NZEB) level for all non-residential buildings (level for building code)	41+1,000/A kWh/m^2 per year	Primary energy, where A is the heated gross floor area.
02.09	Year / date for nearly zero energy (NZEB) as level for non-residential buildings (as indicated in 02.06)	1 July 2016	
02.10	Are nearly zero energy buildings (NZEB) defined using a carbon or environment indicator?	No	
02.11	Is renewable energy a part of the overall or an additional requirement?	Part of the overall requirement. Local electricity production up	m² heated gross floor area.

no	Key Implementation Decision – New Buildings	Description / value / response	Comments
		to a maximum of 25 kWh (primary energy)/m²	
02.12	If renewable energy is an additional requirement to NZEB, please indicate level		
02.13	Specific comfort criteria for new buildings, provide specific parameters for instance for airtightness, minimum ventilation rates	Airtightness better than 1.0 l/s.m² @ 50 Pa. Minimum ventilation rate 0.3 l/s.m². Max 100 hours above 27°C and 25 hours above 28°C.	Valid for residential buildings

Key Implementation Decision - Existing Buildings

no	Key Implementation Decision – Existing Buildings	Description / value / response	Comment
03.01	Is the level of nearly zero energy (NZEB) for existing buildings set in national legislation?	According to (EU) 2016/1318 2.5, 'Refurbishment into NZEB' means a refurbishment of a magnitude that allows the energy performance requirements of a NZEB level to be met. Thus, the level of NZEB is found in the Building Regulations 2018 (BR18) § 259 for residential buildings and § 260 for non-residential buildings.	Commission Recommendation (EU) 2016/1318 of 29 July 2016 on guidelines for the promotion of nearly zero-energy buildings and best practices to ensure that, by 2020, all new buildings are nearly zero-energy buildings
03.02	Is the level of nearly zero energy (NZEB) for existing buildings similar to the level for new buildings?	Yes, as described in 03.01	
03.03	Definition of nearly zero energy (NZEB) for existing residential buildings (if different from new buildings)	Same as new buildings	
03.04	Definition of nearly zero energy (NZEB) for existing non-residential buildings (if different from new buildings)	Same as new buildings	
03.05	Overall minimum requirements in case of major-renovation	BR18: • Energy demand in relation to conversions and replacement of building parts § 274 – 279 • Renovation classes for existing buildings § 280 – 282	
03.06	Minimum requirements for individual building parts in case of renovation	Minimum requirements for individual building parts are found in BR18 Appendix 2, Table 3.	
03.07	National targets for renovation in connection to Long Term Renovation Strategy (number or	Work on the national targets is currently underway.	

<table>
<tr><th>no</th><th>Key Implementation Decision – Existing Buildings</th><th>Description / value / response</th><th>Comment</th></tr>
<tr><td></td><td>percentage of buildings)</td><td></td><td></td></tr>
<tr><td>03.08</td><td>National targets for renovation in connection to Long Term Renovation Strategy (expected reductions and relevant years)</td><td>Expected reduction of net heat energy consumption for residential buildings:<table><tr><th></th><th>2017</th><th>2020</th><th>2025</th><th>2030</th></tr><tr><td>kWh/m²</td><td>119,7</td><td>118,7</td><td>116,0</td><td>113,4</td></tr></table></td><td></td></tr>
</table>

Key Implementation Decision - Energy Performance Certificates

no	Key Implementation Decision – Energy Performance Certificates	Description / value / response	Comment
04.01	Number of energy performance certificates per year (for instance average or values for of 3-5 years)	Approx. 61,000 across building categories.	See Table 3
04.02	Number of EPCs since start of scheme	794,000	From September 2006 to March 2020
04.03	Number of EPCs for different building types	See Table 3	
04.04	Number of assessors	The DEA only records companies: companies in total = 184 with approx. 900 assessors.	End of 2019
04.05	Basic education requirements for assessors	Assessors achieve the competence requirement by passing an educational requirement. As part of the education, there is a physical building inspection. The entry requirement is a competency requirement corresponding to level 4 on the EQF scale. After completing the educational requirement, the assessor remains at EQF level 4.	
04.06	Additional training demands for assessors	The educated assessor must be employed by a company that meets the requirements set by the DEA, e.g., there is a requirement for the implementation of quality management according to DS/EN ISO 9001.	
04.07	Quality assurance system	The quality control performed by the DEA is based on a combination of validity control of the building input data used in issuing the energy label and a risk-based control of issued energy labels.	New approach for control from 2019
04.08	National database for EPCs	Yes, since 2006.	
04.09	Link to national information on EPCs / Database	https://emoweb.dk/emodata/test/ (https://emoweb.dk/emodata/test/)	User access is created by contacting the DEA.

Key Implementation Decision – Smart Buildings and Building Systems

no	Key Implementation Decision – Smart Buildings and Building Systems	Description / value / response	Comment
05.01	Is there a national definition of smart buildings?	No	
05.02	Are there current support systems for smart buildings?	No	
05.03	Are there currently specific requirements for technical building systems (for instance in building codes)?	Yes	According to the Danish Building regulations (BR18)
05.04	Are there current requirements for automatics (for instance in building codes)?	Yes	According to the Danish Building regulations (BR18)
05.05	Chosen option A or B for heating systems (inspection or other measures)	B	
05.06	Number of heating inspections; reports per year (if option A)	-	
05.07	Chosen option A or B for cooling systems (inspection or other measures)	B	
05.08	Number of air-conditioning / cooling system inspections; reports per year (if option A)	-	
05.09	Is there a national database for heating inspections?	No	Denmark has implemented the alternative approach in article 14 (3).
05.10	Is there a national database for cooling / air-conditioning inspections?	No	Denmark has implemented the alternative approach in article 15 (3).
05.11	Are inspection databases combined with EPC databases for registration of EPCs and inspection reports?	No	Denmark has implemented the alternative approach in article 14 (3) and 15 (3).
05.12	Link to national information on Inspection / Database	-	

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement № 820497.